Yun Cheng

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RESEARCH INTERESTS

Theoretical machine learning, multimodal machine learning, representation learning, neuroscience-inspired algorithms

ACADEMIC BACKGROUND

Princeton University — Princeton, NJ
Incoming Ph.D. in Computer Science — September 2023

Carnegie Mellon University — Pittsburgh, PA
M.S. in Machine Learning — December 2022
GPA 4.14/4.33

- Advised by Prof. Louis-Philippe Morency
- *Selected Coursework: Intermediate Deep Learning, Machine Learning in Practice, Probalistic Graphical Models, Convex Optimization, Advanced Multimodal Machine Learning*

Carnegie Mellon University — Pittsburgh, PA
B.S. in Computer Science (University Honors) — December 2021
B.S. in Discrete Mathematics and Logic (University & College Honors)
GPA 3.85/4.0

- *Selected Coursework: Intro to Deep Learning, Probability and Mathematical Statistics (PhD), Multimodal Machine Learning, Intro to Machine Learning (PhD), Design and Analysis of Algorithms, Distributed Systems, Graph Theory*

PUBLICATIONS & PREPRINTS

1. PP. Liang, Y. Lyu, X. Fan, Z. Wu, **Y. Cheng**, J. Wu, L. Chen, P. Wu, M. A. Lee, Y. Zhu, R. Salakhutdinov, L. Morency, MultiBench: Multiscale Benchmarks for Multimodal Representation Learning, In *Proceedings of the Neural Information Processing Systems Track on Datasets and Benchmarks (NeurIPS)*, volume 1, 2021.
2. **Y. Cheng**, Y. Liu, T. Tkocz, A. Xu, Typical Values of Extremal-Weight Combinatorial Structures with Independent Symmetric Weights, Preprint (2021), arXiv:2211.12348, to appear in Electron. J. Combin.
3. PP. Liang, **Y. Cheng**, X. Fan, C. K. Ling, S. Nie, R. Chen, Z. Deng, F. Mahmood, R. Salakhutdinov, L. Morency, Quantifying & Modeling Feature Interactions: An Information Decomposition Framework. Submitted for publication.
4. PP. Liang, **Y. Cheng**, L. Morency, R. Salakhutdinov, Multimodal Fusion Interactions: A Study of Human and Automatic Quantification. Submitted for publication.
5. PP. Liang, C. K. Ling, **Y. Cheng**, A. Obolenskiy, Y. Liu, R. Pandey, A. Wilf, L. Morency, R. Salakhutdinov, Multimodal Learning Without Labeled Multimodal Data: Guarantees and Applications. Submitted for publication.
6. PP. Liang, Y. Lyu, X. Fan, A. Agarwal, **Y. Cheng**, L. Morency, and R. Salakhutdinov, MultiZoo & MultiBench: A Standardized Toolkit for Multimodal Representation Learning. Submitted for publication.

RESEARCH EXPERIENCE

Carnegie Mellon University, Multicomp Lab — Pittsburgh, PA
Research Assistant — November 2020 - Present

- Evaluated the robustness of 20 state-of-the-art multimodal approaches and proposed a new benchmarking methodology that assesses the generalizability and modality robustness of multimodal models
- Proposing a latent concept representation model, generalizing utility statistics of each input modality from synthetic to real-world distributions, and proposing multimodal model selection guidelines for reliable deployment of multimodal models
- Adapting personalized federated learning in learning privacy-preserving markers of mood from partially observed mobile data and improving the performance in capturing individual mood fluctuations

Carnegie Mellon University, BrainML Lab — Pittsburgh, PA
Research Assistant — January 2022 - Present

- Adapting multimodal fusion techniques on brain data for emotion recognition in multi-party conversations

CMU Summer Experiences in Mathematical Sciences (SEMS) — Pittsburgh, PA
Research Assistant — June 2020 - January 2021

- Established asymptotically tight bounds for expected value of combinatorial structures when weights are independent symmetric random variables (satisfying a mild condition on tail probabilities)

CMU Summer Undergraduate Research Apprenticeship (SURA) — Pittsburgh, PA
Research Assistant — May 2019 - August 2019

- Constructed binomial models for discontinuous change in investment strategy with two-tier incentive and solved the optimization problem with respect to optimal portfolio and payment coefficients

WORK EXPERIENCE

Amazon Robotics — Remote
Software Development Intern — May 2021 - August 2021

- Developed self-contained metric generators for postprocessing performance data of simulation runs and incorporated them into the simulator pipeline

COURSE PROJECTS

Carnegie Mellon University — Pittsburgh, PA

Improving Semantic Relation Prediction using Global Graph Properties

- Extended the graph motifs of ERGMs to include combinatorial features to help constrain local predictions, replaced negative sampling with hierarchical softmax, and improved computation efficiency and performance on infrequent words

Few-Shot Learning for Images

- Proposed a weighted distribution calibration to alleviate bias of distribution of novel classes by generating data from a calibrated distribution using transferred statistics of all base classes

Action Segmentation on Large Egocentric Cooking Dataset

- Proposed the first multimodal approach in video action segmentation that refines unimodal video segmentation results with a video-to-text retrieval module

Emotion Detection with Ensemble-based CNN

- Applied transfer learning and ensemble modeling, obtained 5.4% performance gain and improved interpretability using occlusion-based saliency maps

TEACHING EXPERIENCE

Carnegie Mellon University — Pittsburgh, PA

Teaching Assistant

11-877 Advanced Multimodal Machine Learning — January 2023 - May 2023

- Led group discussions on recent technical challenges with multimodal representation, alignment, reasoning, generation, co-learning, and quantification

11-866 Artificial Social Intelligence — January 2023 - May 2023

- Led group discussions on theories and ethical implications of social intelligence and real-world applications in social robotics and affective computing

11-777 Multimodal Machine Learning — August 2022 - May 2023

- Mentored 5 team projects on visio-linguistic compositionality, multimodal QA, and multimodal emotion recognition
- Guided the teams in exploring research ideas in multimodal representation, fusion, and translation, and provided dedicated feedback for each milestone

10-301/601 Intro to Machine Learning — January 2021 - December 2021

- Led recitation and designed homework/exam questions for 500+ students
- Received Machine Learning TA award

21-128/15-151 Mathematical Concepts and Proofs — August 2019 - December 2020

- Led recitation and designed homework/exam questions for 300+ students

21-127 Concepts of Mathematics — May 2020 - August 2020

- Hosted office hours for 50+ students and provided personal tutoring

HONORS & AWARDS

Mathematics Prize — 2022
CMU SCS DEI Grace Hopper Sponsorship — 2022
Machine Learning TA Award — 2020-2021
Dean's List, High Honors — 2018-2022

SKILLS

Programming Languages: Python (NumPy, PyTorch, Tensorflow, Scikit-Learn, CVXPY, Pandas, Matplotlib), C/C++, Java, Go, Standard ML
Languages: English, Mandarin (Native or Bilingual)

PROFESSIONAL SERVICE

Reviewer — 2022
NeurIPS 2022 Track Datasets and Benchmarks

- Provided detailed revision comments for two submissions